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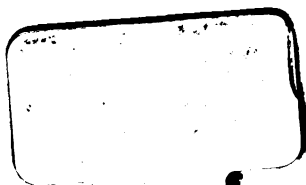
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18949



To the Bodleian Library;
November 21, 1914, from
Edward S. Dodgson, M.A.,
nephew of Henry Grose
Smith Esq; the wellknown
entomologist of The Priory,
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inguma bat bezala loez lore nabil



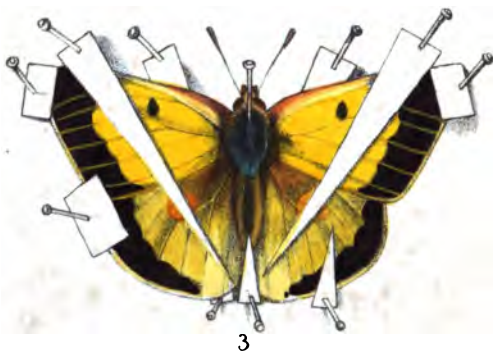
**INSTRUCTIONS FOR COLLECTING
INSECTS, CRUSTACEA,
AND SHELLS.**

•



LONDON :
C. WHITTINGHAM, 21, TOOKS COURT,
CHANCERY LANE.





INSTRUCTIONS
FOR COLLECTING, REARING, AND PRESERVING

British & Foreign Insects:

ALSO FOR COLLECTING AND PRESERVING

Crustacea and Shells.

BY ABEL INGPEN, A.L.S. & M.E.S.

**"Magna opera JEHOVÆ, explorata omnibus
volentibus ea." Ps. cxi. 2.**

Second Edition,

WITH CONSIDERABLE CORRECTIONS AND ADDITIONS.

LONDON:
WILLIAM SMITH, 113, FLEET STREET.

1839.



TO
ALL WHO ADMIRE THE INSECT
CREATION,
THIS SECOND EDITION IS
DEDICATED
BY THE AUTHOR.

" —— Ten thousand different tribes !
People the blaze. To sunny waters some
By fatal instinct fly ; ——
—— Through the green wood glade
Some love to stray ; there lodged, amus'd and fed,
In the fresh leaf. Luxurious, others make
The meads their choice, and visit every flower,
And every latent herb." ——

THOMSON.

" —— Thy desire, which tends to know
The works of GOD, thereby to glorify
The great Workmaster, leads to no excess
That reaches blame, but rather merits praise
The more it seems excess." ——

MILTON.

DESCRIPTION OF THE PLATES.

PLATE I.

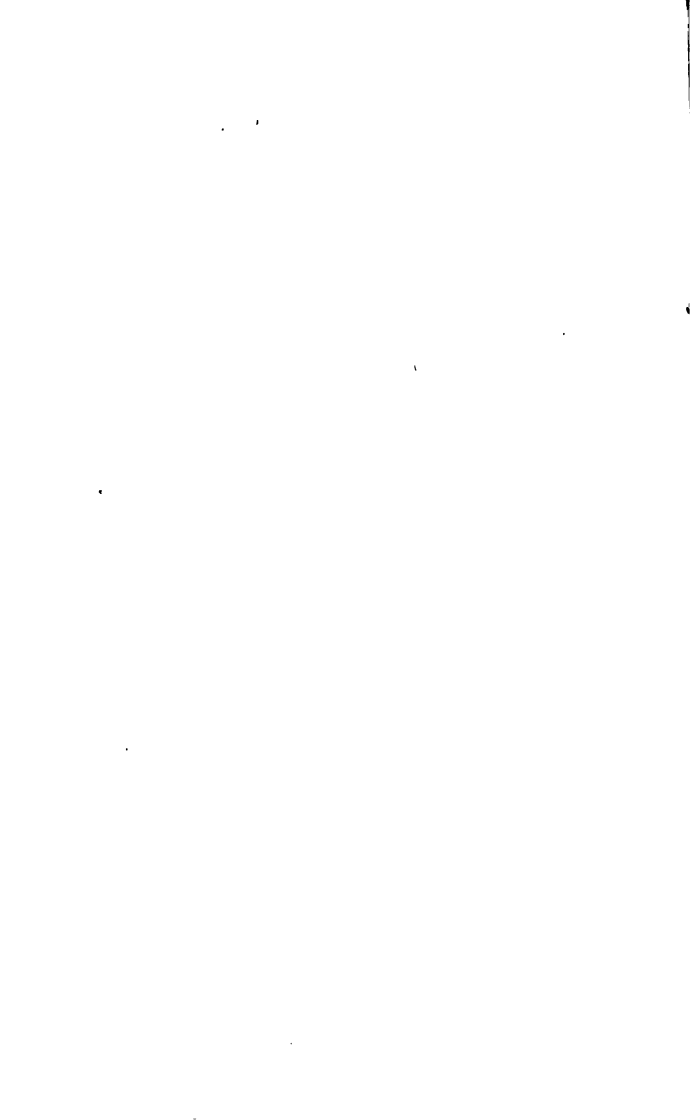
- Fig. 1. *Cicindela germanica*.
 2. *Nomada signata*.
 3. *Colias Edusa*.
 4. *Corizus Hyoscyami*.
 5. *Syrphus lucorum*.
 6. *Dyschirius gibbus*.
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box and cabinet maker ; and Bew, in Newgate Street, also furnishes apparatus. Messrs. Bentley and Chant, of King's Head Court, St. Martin's Le Grand, opticians and entomologists, furnish the best and most useful pocket lenses ; and Durnford, Gracechurch Street; and Hale, Dover Road, Borough, the best insect pins.

Chelsea,
May 20th, 1839.



INTRODUCTION.

THE contemplation of the works of the CREATOR is the highest delight of the rational mind. In them we read, as in a volume fraught with endless wonders, the unlimited power and goodness of that BEING, who, in the formation of Atoms, and of Worlds, has alike displayed unfathomable Wisdom.

There are few objects in Nature which raise the mind to a higher degree of admiration, than the Insect creation. Their immense numbers—endless variety of form—astonishing metamorphoses—exceeding beauty—the amazing minuteness of some, and the complex and wonderful organization of others, far exceeding that of the

higher animals—all tend to prove an Almighty artificer, and inspire astonishment and awe!

But in reviewing the amazing endowments of these endless tribes of beings, which administer so much to the gratification of our mental and ocular faculties, the great utility, and important advantages derived from many of them, have also another claim upon our regard. The delicious luxury furnished by the *bee*, and the beautiful dye of the *coccus*: the materials for an exquisite fabric, prepared by the *silk worm*, which gives employment to millions! and the ingredient produced by the *gall-fly*, to which mankind is deeply indebted for the promulgation of knowledge! are all real benefits. And from others, lessons of industry and economy; virtue and morality; perfection in various arts, and even civil government, may be learned; and, accordingly, some have been held up as models of conduct, and referred to for instruction in wisdom from the days of Solomon.

These few facts may be sufficient to prove, that, so far from entomology being a frivolous amusement (as some have ignorantly asserted), or suffering in importance by comparison with other studies, it stands in the foremost rank of Natural Science! and furnishes more links, perhaps, than any other, to prove the existence of

“ The mighty chain of beings, lessening down
From INFINITE PERFECTION to the brink
Of dreary Nothing, desolate abyss!”

“ Organized nature is a complicated chain of beings, of which chain, each species forms a link. Every new species added to our list, serves thus to increase our knowledge of this stupendous system—a system that ought to excite in every breast the most intense interest; not merely as one of the works of our CREATOR, but as that particular work of the DIVINE HAND, which has been designed with direct reference to ourselves. A minute beetle, therefore, which of itself scarcely raises a thought in our minds, beyond

what may originate in its splendour of colour, or its eccentricity of form, becomes absolutely important when described in reference to its fellows." *Annulosa Javanica*.

**OF APPARATUS, AND METHOD
OF USING IT.**

OF APPARATUS, AND METHOD OF USING IT.

“ THE collector when he makes an excursion should have *three* principal objects in view, for which he ought to be duly prepared. The first is to *find* insects, the next is to *catch* them, and the last, when taken, to bring them *safe* home. In exploring their haunts, he must also recollect that some will be *reposing*; others *feeding*; others *walking* or *running*; others *flying*; others *swimming*; others *lurking* in various places of concealment, and in *different* states of existence.”* It is necessary, therefore, that he should be provided with proper instruments to collect them, and to preserve them when collected. For this purpose the following apparatus is used by the London collectors. But first, it may be

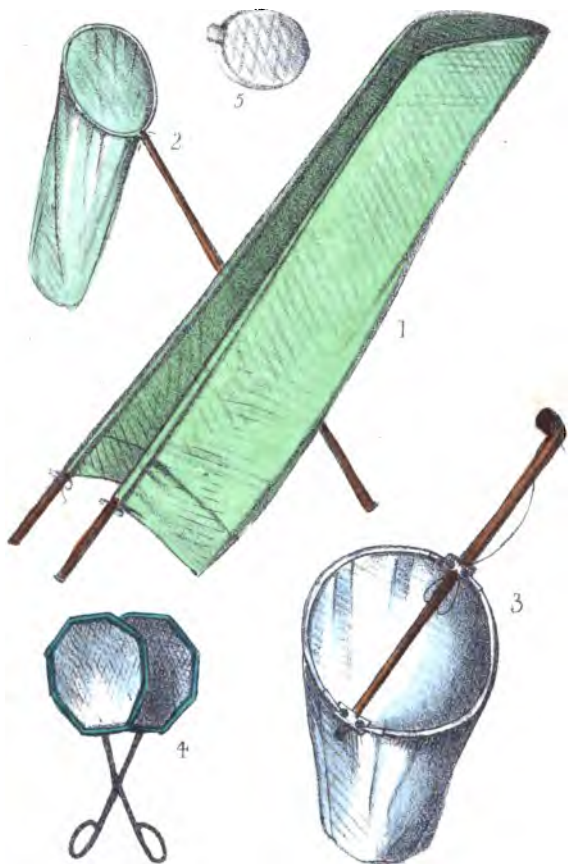
* Kirby.

necessary to recommend the collector to provide himself with a collecting coat. This may be made of any light material, which at the same time is waterproof. Mr. Newman recommends *green lasting*. The form of a common shooting jacket with extra pockets is perhaps best, and the accompaniment of a common haversack will be found useful. One pocket should contain some provision. Hard eggs and a flask of weak spirits and water will be found acceptable in the woods.

1. A CLAP NET (Pl. 2, fig. 1), is the first instrument in point of importance. This is similar to a *Bat-fowling net*, and should be made of green or white gauze or muslin; the advantage of the latter colour is, that minute insects are easily discovered on it; but a green net must be used for *nothing*. When the net is used, the rods must be taken one in each hand, so as to keep it extended; and when it is brought fairly beyond the insect pursued, and struck upwards, the rods must be quickly closed. This net answers very effectively for taking even the minutest insect on the wing, as it may in an instant be opened and folded together. It is also useful for taking winged insects when at rest upon the ground, by simply spreading it over them. When beating

into the net, it will be necessary to keep both sticks in the left hand, at the same time keeping the head of the net as wide open as possible. In the absence of a *clap-net*, an *open umbrella* will in general be found convenient for beating into; particularly if the inside be lined with white cotton, and made to cover the whalebone. In beating into an umbrella, the *forceps* should always remain within it, to be ready for instant use in catching any winged insect beaten out.

2. A WATER NET (Pl. 2, fig. 2). The hoop of an angler's landing net, with a bag of fine *sampler* canvas a foot deep, will be found the best for this purpose, as it may be folded and carried in the pocket. The socket may be made to screw into a walking or beating stick. This net is intended for taking aquatic insects, and should be drawn well under the weeds and round the roots of water-plants, and along the margins of ponds, rivers, and ditches; and also among the mud at the bottom. A bag net made of green gauze, from two to three feet long, and fitted to the same hoop, may be made to serve various purposes. With it *butterflies*, *moths*, and other insects on the wing may be caught, and by giving it a twist the mouth may be completely closed, so as to pre-

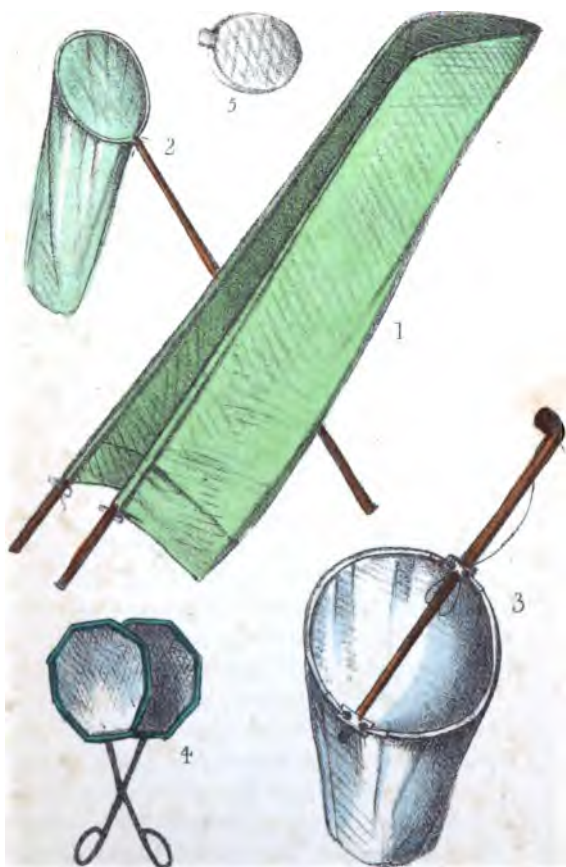


vent the escape of the captive. When fixed to a pole twenty or thirty feet long, Mr. Hawthorth considered it the best net for taking the *Purple Emperor butterfly*, (*Apatura Iris*) whose residence is generally on or near the tops of oaks. It will also be found useful for brushing grass and herbage, as, from its depth, flying insects cannot readily escape. If the hoop of the water net be considered too small, a piece of cane or whalebone bent to the size required, and tied to the stick, will be a good substitute. But

3. A SWEEPING NET (Pl. 2, fig. 3) will be found best adapted to this purpose, the bag to be made of cheese cloth two feet long. The net is to be held in the right hand, and the cord in the left; by relaxing the cord the net instantly closes. It may be used also for catching flying insects.

4. The FORCEPS, (Pl. 2, fig. 4.) are indispensable. They are held and moved like a pair of scissors, and are extremely useful in taking *bees*, *wasps*, and other insects which inhabit sand banks, as well as any other insect at rest. If an insect be on a leaf, both leaf and insect must be inclosed. If the insect be a *butterfly*, *moth*, or *bee*, the underside of the *thorax* (that part to which the wings and legs are attached)







should be sharply pressed; it may then be dropped into the hand, and pierced, or a pin passed through the *thorax* (as shewn, Pl. 1, figs. 3, 4, 5), while the insect is confined in the net.

5. A RING NET, covered with net or gauze, (Pl. 2, fig. 5) will be found useful to place over moths, settled on pales, trees, &c., by which means they may be easily captured.

6. PINCHER FORCEPS (Pl. 3, fig. 1), either curved or straight, are useful for taking bees, &c. out of holes, as are also

7. PLIERS (Pl. 3, fig. 2) about six inches long, for the same purpose, and for picking out minute insects from dung, &c. A *wet finger* will also be found very useful in taking up small insects when crawling or at rest.

8. A DIGGER (Pl. 3, fig. 3) is useful for digging into banks, gravel, and sand-pits, round trees, &c. and into bark and rotten wood. But

9. A BARK KNIFE, (Pl. 3, fig. 4) the blade made of stout steel, about six inches long, will be found to be the best instrument for digging into bark and rotten wood. As a companion to this instrument, a good strong clasp knife, having also a saw blade, is recommended.

10. A PHIAL, (Pl. 3, fig. 5) or tin bottle, having a quill passed some distance through

the cork with a cork stopper, is very convenient for collecting small *beetles*, &c. If bruised laurel leaves be kept therein, the insects will be quickly killed. If spirit be used, only dark coloured beetles and bugs should be admitted. But a dry bottle containing some camphor and bits of blotting paper, is preferable.

11. QUILLS (Pl. 3, fig. 6) having one end carefully stopped with cork and wax, and the other with a cork stopper, are necessary for keeping minute insects secure. The quill should be shaken every time a fresh insect is put in, to prevent those already captured from escaping.

12. A POCKET COLLECTING BOX (Pl. 3, fig. 7). The collector should be furnished with several light corked boxes of convenient size for the pocket.* In these boxes are to be placed those insects which are pierced, and which would be injured by remaining loose. Some bruised laurel leaves should be kept in a corner of the box for the purpose of readily killing the insects. If the collector be on an excursion for more than a day, he must furnish himself

* The inside of the crown of a hat, lined with cork, of about a quarter of an inch thick, and covered with white paper, will be found a convenient and constant companion.

with the necessary quantity of store boxes, pins, braces, &c.

13. STORE BOXES may be made upon the principle of backgammon boards, of about twelve by eighteen inches long, and four inches deep; and lined with cork top and bottom, and made to fasten close. Camphor must always be secured in the store boxes to keep out *mites*, &c.

14. A POCKET LARVÆ BOX (Pl. 3, fig. 8). This is necessary for collecting and the safe conveyance of *caterpillars*, and should be made of tin, perforated with minute holes, and having a hole at one end, with a cork attached. Some of the plants on which the *caterpillars* are found, must be placed with them.

15. BREEDING CAGE (Pl. 3, fig. 9). This is for the purpose of rearing *butterflies* and *moths*, from *caterpillars*, and may be of any form or size. The following, described by Mr. Stephens, is well adapted to the purpose. "The length of the box is twenty inches; height, twelve; and breadth, six; and it is divided into *five* compartments. Its lower half is constructed entirely of wood,* and the upper of

* If made of deal or fir it should be well lined with paper, to prevent injury to the *caterpillars* from the effluvia of turpentine. A. I.

coarse gauze, stretched upon wooden or wire frames; each compartment has a separate door, and is moreover furnished with a phial in the centre for the purpose of containing water, in which the food is kept fresh; and is half filled with a mixture of fine earth and the dust from the inside of rotten trees; the latter article being added for the purpose of rendering the former less binding upon the *pupæ*, as well as highly important for the use of such *larvæ* as construct their cocoons of rotten wood. The chief advantages of a breeding cage of the above construction are, the occupation of less room than five separate cages, and a diminution of expense; both important considerations when any person is engaged extensively in rearing insects. Whatever be the construction of the box, it is highly necessary that the *larvæ* be constantly supplied with fresh food, and kept very clean, and that the earth at the bottom should be kept damp. To accomplish the latter object, I keep a thick layer of moss upon the surface, which I take out occasionally (perhaps once a week in hot weather, and once a fortnight or three weeks in winter) and saturate completely with water, and return it to its place: this keeps up a sufficient supply of moisture, without allowing the earth to become

too wet, which is equally injurious to the *pupæ*, with too much aridity. By numbering the cells, and keeping a register corresponding with the numbers, the history of any particular *larva* or brood may be traced." *Caterpillars* may be inclosed with the leafy branches of trees, shrubs, &c. in gardens, by means of gauze bags. They should be shifted from time to time to other branches, as the leaves become exhausted. Collectors would do well to keep a few young trees of oak, birch, and willow, growing in their gardens. In towns they may, in many situations, be grown in large pots.

The *Sphingidæ* and some of the *Noctuæ* may be reared in large flower pots well drained, sunk into the ground, and nearly filled with willow mould, or very light sandy earth, the pots being covered with copper gauze wire. By being placed in a more natural state than in cages, there will be a much greater chance of success in rearing the moths.

It is very desirable (if it can be accomplished) to keep at least each kind of *caterpillar* distinct, as some species will devour others, and even their own kind. They must never be disturbed while changing their skins. The breeding cages must be constantly watched in order to secure the perfect insect as soon as it ap-

pears, and before it has time to injure itself by attempting to escape. Such as are inclosed in a hard case, as the *Puss moth*, (*Cerura Vinula*,) &c. should, when near the time of coming forth, be carefully freed from it, as the plumage of the moth is often injured when left to itself. The breeding cage should be kept in a cold damp place.*

16. CAGES will also be necessary for rearing the *grubs* or *maggots* found in dung, rotten trees, &c. The best thing for this purpose is a stone jar, of about a foot in depth, and three or four inches in diameter, having a tin lid made to fit very close, and perforated with minute holes to let in the air. The *grubs* taken from old trees may be placed in a separate jar, and lightly covered with decayed wood; and those taken from dung may also have a separate jar, and some dung placed over them, and kept slightly damp, but not wet. Another jar may be kept for the *grubs* and *maggots* found in dead animals or animal matter. The jars should be frequently examined, to secure the perfect insects. Some of the

* In case of a sudden influx of caterpillars, tumblers, flower pots, hat boxes, &c. covered with gauze, may be called into active service.

water bugs (*Velia Rivulorum* and *Hydrometra stagnorum*) are occasionally found with wings, but such individuals are of rare occurrence. And as their economy is very little known, the plan suggested by Mr. Curtis,* for confining different species "in a frame covered with coarse gauze, and floating them," would be an easy method of studying their natural history. The *caddis worms* might be bred in a frame, sunk to the bottom of a pond, allowing part of the frame to rise above the surface of the water.† Many of the imperfect *field bugs* (*Cimices*) may be reared in cages, taking care to supply them plentifully with the plant on which they are found. To study the natural history of any insect, it should be bred from the egg, and closely watched through all its changes.

17. PILL BOXES. The collector should carry out with him several dozen of pill boxes of various sizes; the smallest size for minute *moths*, *flies*, &c. Only a single insect should be placed in each box, as in opening the lid to

* British Entomology, vol. i. fo. 2.

† Mr. Donovan says, that "Swammerdam used to hatch the *eggs*, feed the *larvæ*, and preserve the *pupæ* of aquatic insects, in a shallow dish, which he covered with white paper, occasionally moistened, and pierced in several parts for the admission of air."

put in another, the first would either escape or get crushed. Small moths and flies at rest on pales, walls, trunks of trees, &c. are easily captured by means of a pill box—holding the bottom in the left hand, and the top in the right, and by bringing them close together shut the insect therein. It is best to put the empty boxes in one side pocket, and the filled ones in another. Before going out the collector should see that his box lids fit tight, and that the tops and bottoms are perfectly secure.

18. PINS. The size of the pin must be adapted to that of the insect. The collector should never fail to take out a cushion filled with pins of various sizes. Bent pins (Pl. 3, fig. 10) are very useful in setting the legs of insects. Needles must never be used for piercing insects, as they always rust.

19. POCKET LENS (Pl. 3, fig. 11). The best kind is that which contains three glasses in one case, the focal distances of which are half an inch, one inch, and two inches; these three glasses will, simple and combined, give seven distinct powers. But a CODDINGTON or STANHOPE LENS is indispensable for minute insects.

20. A STAND (Pl. 3, fig. 12), having a cork let into the top and covered with paper, is useful in examining insects.

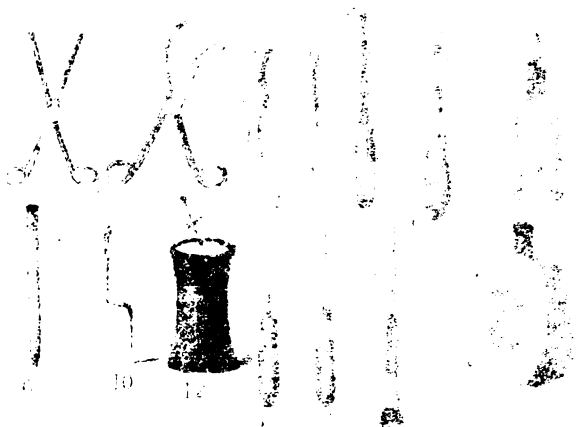
21. **SETTING NEEDLE** (Pl. 3, figs. 13, 14, 15) is simply a needle fastened into a thin piece of wood about three inches long; on the other end of which a camel's hair pencil may be secured. A pin curved towards the point, and fastened into a piece of wood, will also be found useful. These instruments are necessary for extending the wings and legs of insects; and the pencil for brushing off dirt, or extending the antennæ and legs of those which are minute.

22. **BRACES**, are merely triangular slips of card used for confining the wings, &c. of the larger species. They should be made of stout hotpressed writing paper for delicate insects.

23. **SETTING BOARDS** are pieces of board covered with cork and papered. The cork should be close grained, a quarter of an inch thick, and perfectly smooth. To dry insects, and at the same time to secure them from accidents, a box about a foot high, and nine inches square, having grooves in the sides three inches apart for the setting boards to slide in, is necessary (Pl. 3, fig. 16). The door may be merely a frame covered with muslin or wire gauze to admit air. At the bottom a drawer may be constructed, with divisions, for holding pins of different sizes, braces, setting needles, &c.

24. **CABINET.** The present state of *British* entomology, requires a cabinet of at least one hundred glazed and corked drawers. The best sized drawers are from fourteen to sixteen inches square, and about two inches deep. For exotic insects they must be larger and deeper. Cabinets arrange best in tiers of about twenty drawers each, shut in by a door; or double tiers may be made with folding doors: in this shape, they are rendered portable, and others may be added as the collection increases, corresponding in size and uniformity.

25. **BOOK BOXES.** Some persons arrange their collections in book boxes, and place them on shelves. DOWNIE'S boxes are particularly well made, and although not glazed yet the dust is excluded. They may be lettered and numbered.

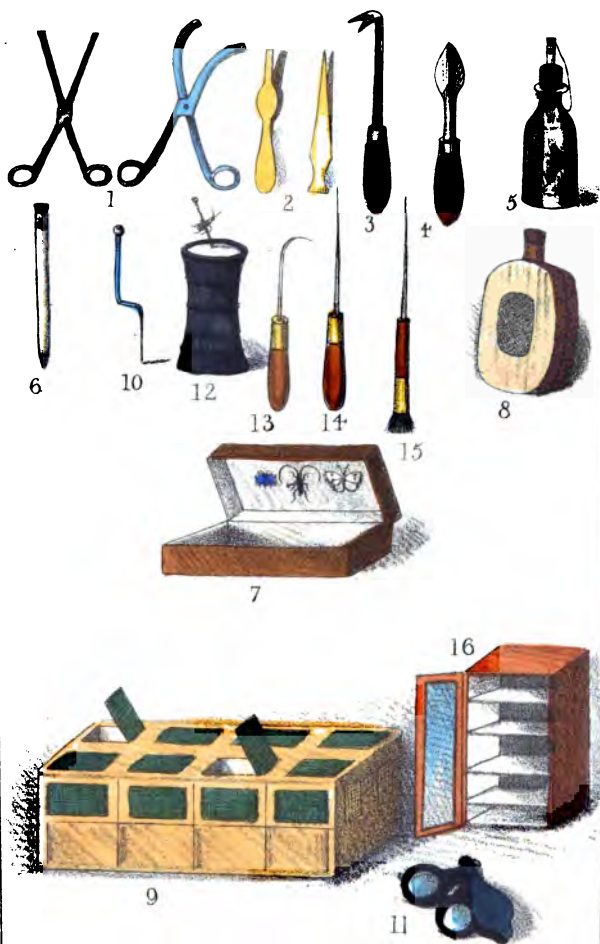


BC



APPARATUS.

1. *Electrolytic cell*.—The present state of *British* electrochemistry is such that the only electrolytic cell available for the purpose of the present investigation is the *Wiedemann* cell. The design of this cell is shown in the accompanying diagram. It consists of a glass vessel containing a solution of the electrolyte, and a central electrode (A) surrounded by a porous plug (B). The plug is made of a material which is insoluble in the electrolyte, and is connected to the central electrode by a wire (C). The plug is also connected to the outer electrode (D) by a wire (E). The plug is connected to the outer electrode (D) by a wire (F). The plug is connected to the outer electrode (D) by a wire (G). The plug is connected to the outer electrode (D) by a wire (H). The plug is connected to the outer electrode (D) by a wire (I). The plug is connected to the outer electrode (D) by a wire (J). The plug is connected to the outer electrode (D) by a wire (K). The plug is connected to the outer electrode (D) by a wire (L). The plug is connected to the outer electrode (D) by a wire (M). The plug is connected to the outer electrode (D) by a wire (N). The plug is connected to the outer electrode (D) by a wire (O). The plug is connected to the outer electrode (D) by a wire (P). The plug is connected to the outer electrode (D) by a wire (Q). The plug is connected to the outer electrode (D) by a wire (R). The plug is connected to the outer electrode (D) by a wire (S). The plug is connected to the outer electrode (D) by a wire (T). The plug is connected to the outer electrode (D) by a wire (U). The plug is connected to the outer electrode (D) by a wire (V). The plug is connected to the outer electrode (D) by a wire (W). The plug is connected to the outer electrode (D) by a wire (X). The plug is connected to the outer electrode (D) by a wire (Y). The plug is connected to the outer electrode (D) by a wire (Z).



ated, being figures of all the genera of British Beetles.

Stephens's Manual of British Beetles, to be followed by separate manuals of the other orders.

Wood's Illustrations of British Caterpillars (as a companion to his index), in which it is intended to figure every known caterpillar and chrysalis.

With respect to works on Exotic Entomology, a copious list will be found in Stephens's Systematic Catalogue; as also of almost every British work on Insects published up to 1829.

BOOKS.

“Some books are to be tasted, others to be swallowed, and some few to be chewed and digested.” The latter sort only are here recommended, and which are for the most part indispensable. In all sciences the newest works are or ought to be the best.

Kirby and Spence's Introduction to Entomology,
1818—1827.

Curtis's British Entomology, 1824—1839.

Stephens's Illustrations of British Entomology,
1827—1837.

Shuckard's Essay on the indigenous Fossorial
Hymenoptera, 1837.

Wood's Index Entomologicus, or a complete illustrated catalogue of British Lepidoptera, 1944 figures. 1838.

Westwood's Introduction to the Modern Classification of Insects, 1838—1839.

Many papers in the Entomological Magazine, and Transactions of the Entomological Society of London.

The following Works are in the Press.

Curtis's Synopsis of British Insects, in separate volumes, each volume to contain one or more orders.

Shuckard's Elements of British Insects.

Spry and Shuckard's British Coleoptera deline-

Another year he may devote to *Lepidoptera*, another to *Hymenoptera*, another to *Diptera*, &c. If, however, he should consider this plan too tedious, let him take the different seasons, and devote his attention to a single large group in each season. He is also strongly recommended to keep to one spot, as a single marsh, common, or wood, will, from the obscure habits of some insects, and the periodical appearance of others; changes in the weather, and different periods of the day; produce him profitable employment for several years.

The state of the weather concerns the collector of insects quite as much as the angler. On cold windy days, and particularly if an easterly wind, it is of little use to go out in search of winged insects. But although at such times insects may be sought for in their places of concealment, and some few taken, yet the result of an excursion will rarely be satisfactory. On warm days, however, and particularly in what is called *muggy hot* weather, and after rain, and also on the approach of a thunderstorm, insects will be found in profusion. The morning, and till about one or two o'clock in the afternoon, will gene-

rally be found the best part of the day for collecting. As to prognostics of the weather, the best often fail. The *pimpernal* is not always to be relied on, for it will open in the sun in the morning although it may rain in an hour; nor the *bees*, for though busy in the morning they will often be found *collecting* in the rain. And though Moses Harris says, "it seldom or never happens but a fine day ensues," when the cabbage white butterfly is on the wing in the morning, yet the converse is often experienced. The high flight of swallows, however, will generally be found to indicate dry weather, at least for the day.

The collector should consider before he starts on an excursion, the particular class of insects he intends to search for, and not incumber himself with more instruments than are convenient. He should also bear in mind that the specific characters of many insects are very minute, and that distinct species often bear so close a resemblance to each other, that it is not advisable to attempt to discriminate them abroad, but collect all he can find, as otherwise he may run the risk of losing many new species. Nor should he, while collecting, make a selection of species, nor consider the most beautiful

as alone valuable, for "the vilest insect that crawls is as deserving of notice as the elephant."* From the circumstance, too, that many insects are only abundant at distant and uncertain periods, it is advisable, however common an insect may be, to take a good supply at once, and not run the risk of losing a species by neglecting to take it at the proper time; and when rare and local insects are met with, not to neglect the opportunity of taking sufficient, in order not only to oblige others by the gift of specimens which they may not possess, but also to exchange duplicates for other species which may be desiderata, by which means a mutual benefit is conferred. Persons collecting for their friends should send them as many different kinds and as many of each as possible, and those who oblige their friends, whose object is to collect only the indigenous insects of Britain, should never, on any account, send them foreign species, nor any that are doubtful by being imported with merchandize, timber, plants, seeds, or otherwise, without separating and labelling them accordingly.

The Entomologist would be gratified by information respecting the time of appearance, or

* Macleay.

any other particulars respecting insects captured by others; it would make the labour of the collector doubly valuable. The young student will, of course, keep a regular journal of the time of appearance, habits, locality, food, &c. &c. of the insects which he captures himself—" *de die in diem.*"

The collector should never lose sight of *utility*, but bear in mind the mischief arising from the ravages of noxious insects, such as the turnip fly (beetle), *Tipula*, *Aphis*, &c. and by the study of their habits and economy, aid the endeavours of the agriculturist and gardener to check their devastations.

WINTER.

AT this season of the year there appears so little to attract collectors, that few will venture out; and others are deterred, from the idea that no insects are to be obtained. In certain situations, however, many may be found, which at other seasons of the year are met with only by mere chance. Collecting and examining *moss* will now be found a profitable employment. This should be gathered by the roots from every possible situation in which it can be found, as roots and trunks of trees, foot of walls, banks in dry, sandy, and marshy places, margins of ponds, meadows, commons, &c. The trouble will be well repaid, as myriads of insects make it their winter abode. The best times for collecting moss, are morning and evening; for in the middle of the day, the insects, in mild weather, are either on the wing, or creeping about. The moss may be put into bags, made of brown *jane*, or any other substance of close texture, and should be tied tight at the mouth, to prevent any insects making their escape. It may be minutely examined at home, by shaking a little at a time over a white dish or plate; a white soup plate

is best, as from its depth, few insects can run up the sides. The insects, although in general small are not the less interesting; they should be put into quills as collected, and may be killed, by holding the quills in scalding water for a few seconds, and then pierced, or gummed upon wedges of stiff paper, as hereafter directed. If the labour of examining moss be too great for a person merely collecting for a friend, a quantity gathered from various places would not be an unacceptable present, and might be sent, tied securely, in bags. Tufts of grass, growing on banks, sides of ditches, ponds, roots of trees, &c. may be pulled up and shaken into an *umbrella*, a sheet of paper, or a pocket handkerchief, or taken home. If thrown into water the insects will be found on the surface.

Many insects are found by stripping off the bark from decayed trees, with the digger or bark knife, and also by digging into the rotten wood. A *wet finger* will be found the best mode of taking the small ones. One hand should be held under the bark, when separating it from the tree, to secure any insects that may fall. *Grubs* or *maggots* will also be found, particularly in the dead wood, and must be taken out carefully with a portion of the wood,

and a quantity put with them into a jar. Many *pupæ* will also be found in rotten wood. When a hole is discovered, the wood should be cut from the orifice, and the inhabitant carefully removed. For this purpose the *pliers* or *pincher forceps* will be found useful. Stems of pithy plants, such as the *currant*, *burdock*, *bramble*, *teazleheads*, and various others, should now be collected for the *chrysalides* of *sphinges noctuæ*, *bees*, &c. and preserved in cages. *Beetles* will often be found secreted in the hollow stems of plants.

During mild weather, trees of every kind, and underwood, may be dug round close to the roots, and for several inches from them, to the depth of a foot, particularly on the north side, for *chrysalides* and *beetles*. For this purpose a gardener's trowel, or the digger, may be used; or a small garden fork with prongs six inches long. Stumps of felled trees, and the bark remaining below the surface of the earth, are the resort of some insects. The south side of banks, the foot of pales, walls, &c. ought never to be neglected; many insects may be dug from such situations. *Chrysalides* should be put into a box carried for the purpose, having damp moss at the bottom; care being taken to disturb them as little as pos-

sible, and for safe carriage the box may be filled up with moss, and the *chrysalides* removed into a breeding cage or garden pot. If it be intended to send the *chrysalides* to a distance, they should be carefully packed in a box on layers of damp moss, and filled up with it to prevent their being shaken. The Winter digging for *chrysalides* ought not to commence earlier than toward the latter end of January.

Water insects may be taken in ponds and ditches in mild weather. As, however, they are to be found throughout the year, this occupation should not be followed at any time to the hindrance of digging, and collecting moss. In *fishing* for them the *water-net* must be repeatedly drawn under the weeds, near the surface, and round the roots and stems of those at the bottom of ponds and ditches. Some rare *beetles* are occasionally to be found adhering to the underside of stones in rivulets, and on the margins of brooks, ponds, &c. under the mud. Also by stamping on the ground by the sides of ponds, &c. in boggy grounds, particularly in Spring.

The trunks of trees, pales, and walls (particularly under the projections), bushes in woods, shrubs, &c. in gardens, will produce some species of *moths*, which are not found at other

seasons. Small moths when at rest may be taken by means of a pill box, by placing the box and lid partly opened close to the insect, and shutting it in. The Winter *moths*, although numerous, are generally rare in cabinets, which is to be attributed to the little search that is made for them. An assiduous collector would, there is no doubt, make some new and interesting discoveries at this season of the year. The white thorn and other shrubs and trees should be searched for cocoons of the different species of large *saw-flies* (*Cimbicidæ*).

When examining trunks of trees and projections of pales and walls, *chrysalides* will occasionally be found attached; these must be removed with great care, and placed in an open box in a *dry* breeding cage.

The droppings of horses, cows, deer, and sheep, are very productive of "the shard borne *beetles*," and should be searched throughout the year, and those which bury themselves in the ground dug out; and the *grubs* or *mag-gots*, which inhabit dung, carefully removed into a *jar* kept for the purpose. The *grub* of the *bot-fly* (*Gasterophilus Equi*) will, with others, be occasionally found in horse droppings, and adhering to the coats of the stomach of dead horses.

SPRING.

NATURE is now beginning to assume her "lovely livery of green," and insects, which began to hybernate in the mild days of September and October, are often found alert in the colder temperature of March. *Beetles* will now be found in abundance in every possible situation in Earth, Air, and Water; in dead animals, (moles, dogs, cats, &c.) in gravel and sand pits, under stones, clods, &c., in the bark, under the bark, and in the wood of dead or dying trees, in all kinds of plants and shrubs, in dung and rubbish, and in pits, caves, cellars, stables, and bakehouses. As many beetles, &c. are only to be met with abroad in the evening and night, particularly after warm showers, numbers may be found about gardens, paths, roads, sand and gravel pits, &c. by means of a lanthorn.

As the "juicy groves put forth their buds," various other insects will continually appear. *Beating*, and *sweeping*, may be commenced even in March; and at the beginning of April,

caterpillars will be found. Every kind of tree, shrub, and plant, should be beaten into the *clap net*, or *umbrella*, which must be quickly pushed under the branches or plants intended to be beaten, or the insects will fall to the ground. The sunny sides of the skirts of woods, lanes, hedges, banks and roads, are the most productive places for beating. After several smart strokes with a beating stick, which will be necessary to dislodge many of the *caterpillars*, the produce may be examined, and the insects secured. The best time for obtaining *caterpillars* is early in the morning, and late in the evening by means of a lanthorn, for many feed only at night, and conceal themselves by day.

It is by far the most preferable mode to collect the *caterpillars* and rear them, as the perfect insects which are caught on the wing are seldom found in a fine state. By rearing the *caterpillars* with ordinary care, and watching the appearance of the perfect insect, fine specimens may be obtained. It is, however, by no means intended to dissuade the collector from capturing them under any circumstances, for some species are only to be obtained in their winged state; their *caterpillars* being unknown or difficult to rear. From the middle

to the latter end of May, is the most abundant period for Spring *caterpillars*; or, if the season be very backward, from the beginning to the middle of June; and every exertion should be made to obtain as many of each sort as can be conveniently supplied with food. They require to be very delicately handled, and deposited in the box carried for the purpose, putting with them some leaves of the different plants on which they are found, and not forgetting to carry home a good supply. When taken home, put them immediately into the breeding cage; and when it is necessary to remove them, to supply fresh food, examine the leaves that none be thrown away.

The *butterflies* are day fliers, and many species are to be taken on the wing, from March to September. A simple method will often bring them down even in their most rapid flight, and has been successfully employed in taking the *Purple Emperor butterfly*, (*Apatura Iris*,) namely, to throw up a stone or piece of tile before them, which they will often fly down after and alight on the ground, and are then easily captured. Some species will visit a single blossom, although disturbed half a dozen times; and thus, by watching their

haunts,* may be taken with much less fatigue than running after them. But an hour or two after sunrise they will be found feeding on flowers by the sides of woods, and are easily taken, and about sunset, many will be found on flowers in the same situations and in marshes. A warm damp air which often follows rain, is preferred by many species, when they will be found flying near the ground; and in hot and dry weather, they will occasionally settle on the mud in ditches.

Many *moths* may be beaten from the hedges, &c.; others are to be found settled on trees, pales and walls. Fine evenings, from March to November should be devoted to *nothing*. Some species of *moths* are abroad by day, or in the afternoon, but by far the greater number fly from sunset, to a very late hour. Many fly all night long. When the air is very serene, the skirts of woods, marshes, banks of rivers, and meadows, near hedges, will be found to be the best situations; but if windy, lanes in woods, and sheltered places; “twilight groves” and lanes are at all times excellent places, and

* It should be remarked, that many insects are not only local, but have their peculiar haunts: some species being confined to one certain spot, and are not to be found in any other part of the same wood.

a western aspect the best. Moonlight nights are rather unfavourable for *nothing*. On dark nights, a good plan for a single person to pursue, is to have a small "bull's eye" lantern, with a lamp burner, fastened to his hat by means of straps. If two persons are in company, one may carry a common lantern on a stick, elevated as high as his head, the other following him with the *clap net*. The light will be found to attract insects; and, it is obvious, render it easy for them to be secured. Some insects of other orders will also be found on the wing.

The *field cricket* (*Acheta Campestris*), makes its appearance "about the 10th of March." It is extremely local, and may be taken in the manner pointed out by Mr. White, in his "Natural History of Selbourne."* He states, that he found them inhabiting a "pasture field consisting of a rocky dry soil, and inclining to the afternoon sun." They bore holes in the ground, which generally terminate under a stone, and the only method by which he could obtain them, was to insinuate a pliant stalk of grass into their caverns, and by "probing the windings to the bottom, bring

* Bennett's ed. p. 346.

out the inhabitants." This plan will be useful in collecting other insects in hanks, &c.

Although there is not a single tree, shrub, or plant, on which insects are not to be found, yet a few of the most productive may be pointed out. The *oak* harbours more *caterpillars* than any other tree; some very fine insects are also obtained by beating the branches, and in its decayed wood some rare beetles are to be found. The *poplar*, *lime*, *elm*, *willow*, *sallow*, and their decayed bark and rotten wood, afford food and shelter to immense numbers. The *black thorn*, while in blossom, will repay examination. But "where the *white thorn* whitens with lavish fragrance," numerous species resort. The *furze* also attracts many bees. Before beating any flowering shrub, a cursory glance will often detect an insect feeding on the blossom which may at once be secured with the forceps. "The charming offspring of Flora" should, however, be as little destroyed by beating as possible, as flowers will furnish considerable employment and profit to the collector. They should be constantly watched, as *beetles*, *bees*, and other *flying* insects, are continually in search of "every opening flower," and many hundreds will visit a single blossom in a day. A few *umbelliferous* flowers will produce insects of almost all the orders, and

furnish employment for a whole day. *Sallow* in bloom, attracts several species of *bees* and other insects. *Clover*, *tares*, &c. also while in bloom attract many insects, particularly *moths* in the evening. The flower garden will give constant employment to those who cannot extend their researches. Sand and gravel banks, in fine sunny weather, will be found very productive of *bees*, and other Hymenoptera; they are extremely numerous, and new species are occasionally being discovered. In these situations they are extremely active in their movements, and it will require considerable dexterity to catch them. The *forceps* will be of service close to the banks, and the *clap* or *bag-net* for stragglers.

Some species of wild *bees* are subject to the attack of a most singular parasitic insect, (*Stylops Melittæ*) (found about May at Coombe Wood, &c.) which, from its rarity, and the singularity of its history, is a most interesting and desirable object. This parasite was first discovered on the *Melittæ* (*Andrena*) *nigroænea*, and since on several other species.*

* For a very full and interesting account and figures of the dissections of this singular and interesting insect, vide Kirby's "Monographia Apum Angliæ," Vol. ii. p. 110, and plate 14, No. 2, Fig. 1. &c.

The grub (like the *Ichneumonida* larvæ in caterpillars) actually exists in the internal parts of the bee; and, when ready to assume its perfect state, the *pupa* works its way out between the dorsal segments of the abdomen. The most likely method of obtaining this and other species, is to collect as many wild *bees* as possible, by means of the *forceps*, and to put a few together under tumblers, giving them a little honey and sugar, and allowing them air; or, a small cage might be constructed having the sides covered with *wire* gauze, and in addition to honey and sugar, branches of *sallow* in bloom and fresh flowers might be put into a wide mouthed bottle of water, and placed therein, giving a fresh supply at least twice a day. The *humble bees* (*Bombi*), it is not improbable, may be subject to the attack of a similar parasite.

It should be remarked that the season of many Spring insects is very short, therefore the collector will do well to catch them "while the sun shines."

SUMMER.

ALTHOUGH an industrious collector, by strictly following the foregoing instructions for Winter and Spring, must have collected many species of insects, yet his grand harvest will be at this season. With the exception, however, of the employment to be found on sunny banks, and flowers, and in sand, and gravel pits, the middle of the day is not the most favourable for collecting. For insects in general are so strong on the wing, and fly so high, that it is impossible to catch them; while others conceal themselves to avoid the heat. For beating, the best time is early in the morning and late in the afternoon; and on dull days, which may be appropriated to this purpose.

The flowers of *umbelliferous plants*, in woods and hedge rows, produce myriads of insects. The blossoms of the *elderberry* should be watched particularly at noon in the hottest weather. The best time for collecting from flowers is when the sun shines; although even in dull weather many insects will be found:

and the same flowers which in the day attract various kinds of insects, are at night visited by *moths*, &c. The various *dragon flies* (*Libellulidæ*), will be found at rest on plants near ponds in dull weather, and in the evening, and may then be taken with the fingers ; but when on the wing, they are extremely rapid in flight, and difficult to capture. Some rare insects are found on pine and fir trees, both on the foliage and under the bark, at this season.

The trunks of trees, faggots, hurdles, &c. and dead fences, are the resort of many of the *Cerambycidæ*, &c. in Summer. Dead bushes in hedges should be beaten. But to point out the proper places for collecting, and the different methods, during this season, would be to repeat almost all that has been said under the head of Spring, and to mention every flower, bush, briar and tree, so numerous are the habitats ; they may, however, be summed up by saying—*search every where*.

Water insects are now to be found in great abundance, and may be taken with much less inconvenience than in the Winter months. But the collector must not be discouraged if he should search several ponds and ditches, and yet scarcely find a single insect ; for it often

happens that where they abound at one period, they will be found to have deserted at another.

As soon as the thistles begin to bloom, they are resorted to by different species of *humble bees* (*Bombi*) in company with some *Diptera*, &c.

In August and September, the *grasshoppers* (*Gyrillidæ*, &c.) abound in meadows and marshes, and should not be neglected on account of similarity of appearance. About the same time also the *field bugs* (*Cimices*) may be beaten out of hedges, nettles, grass, &c.

Towards the latter end of June, the curled-up leaves of the *oak*, *poplar*, &c. containing the *chrysalides* of the *Tortricidæ*, should be collected. The Summer *chrysalides* may be dug for towards the latter end of June, and the beginning of July; in the latter month the greatest number of *moths* make their appearance. Some little allowance must always be made for the time of appearance of insects in early and late seasons.

During the Summer the galls which are found on the leaves of the oak, willow, and other trees, and also the oak apples, should be from time to time collected, for the purpose

of rearing different species of *Cynipidæ* and *Calcididæ* (*gall-flies*), &c. and their parasites. Branches of the trees having the galls on the leaves, should be gathered, and the stems put into a phial of water in a breeding cage, and kept until the perfect insects come forth.

AUTUMN.

MUCH of what has been said under the head of Winter will apply to this season. But there is still considerable employment for the industrious. The ground beetles (*Curabi*) now reappear, and the woods will still furnish many species of moths (*Noctuæ*, *Geometræ*, the beautiful button *Tortrices*, and *Tineæ*). The *chrysalides* of the *death's head moth* (*Acherontia Atropos*) and some others, may be taken while potatoes are being dug up, and persons who are thus employed should be directed to carry a box containing damp moss, and to deposite the *chrysalides* as taken; and to disturb them as little as possible. The *death's head moth* appears in October and November. The last general brood of *caterpillars* will be found about the middle of September, some of which live till the Spring, and are very difficult to rear; but the greater part go into the *chrysalis* state before the approach of Winter.

Some species of *gnats* (*Culex*) and *crane-flies* (*Tipulæ*) may be found about ponds,

and windows in houses. The grubs found in apples, pears, and nuts, may be reared with care ; they should be put into a cage having damp earth at the bottom.

“ Ivy is the last flower that supports the *Hymenopterous* and *Dipterous* insects. On sunny days quite on to November they swarm on trees covered with this plant ; and when they disappear, probably retire under the shelter of its leaves, concealing themselves between its fibres and the trees which it entwines.”*

* White.

LOCAL HABITATS.

IN addition to the instructions already given, under the different seasons, a few *local habitats* may be pointed out. For, although there is no situation which does not harbour peculiar insects, yet some places produce a greater abundance than others.

SAND, GRAVEL, AND CHALK PITS. In these places insects are either attracted by the warmth or colour of the soil, fall into the pits by accident, or resort to them in search of their prey. Various kinds of *beetles*, *bees*, and other *four winged* insects, will be found about the banks. It is not enough, however, to search the mere surface ; stones, clods, loose gravel, sand rubbish, and dung, must be turned over, and the banks scraped down with the *digger*. When it is wished to dig an insect out of its hole, a slender stick should be inserted as a guide, otherwise the hole will be lost. The banks of pits and ponds may be trod or dug down, and the loose earth examined ; if the earth and

tufts of grass be thrown into the water, the insects will be easily discovered on the surface. It may be stated, that light and sandy soils furnish the most, and clay the fewest insects. The best pits in the neighbourhood of London are at Charlton, Darenth, Coombe wood, Wandsworth common, and Hampstead heath.

STAGNANT PONDS, ditches, running streams, and their banks, have each their peculiar insects. On examining the surface, many insects which fall in by accident, will be found. *Macronychus 4-tuberculatus* is found on the continent in running brooks, adhering to the underside of stones. If assiduously sought for it might turn up in this country. *Colymbetes pauludosus* is always found in running water.

SANDY SHORES OF THE SEA, AND RIVERS, produce peculiar and valuable insects. Search should be made under stones, rotten wood, dung, dead animals, weeds, and rejectamenta, at all seasons, both above and below high water mark. The bottoms, sides, and fissures of perpendicular rocks should be constantly searched, also salt marshes and brackish waters; and trees, shrubs, and plants, near these situations should be well beaten and examined.

FORESTS AND WOODS. Uncultivated ground is generally the most productive, and in pro-

portion to the extent of its *Flora* insects will abound. The following may, among many others, be mentioned as most excellent places for collecting. A few of the new and rare insects, which have been lately captured, are added, and may be considered as an earnest of still further novelties. *New Forest*, Hants. *Paxylomma buccata*. *Baris analis*. *Colydium elongatum*. *Cicada hæmatodes*. *Cucujus unifasciatus*.—*Epping Forest*, Essex. *Cicindela Sylvicola*. *Philanthus androgynus*.—*Sherwood Forest*, Nottinghamshire. *Hylecætus dermes-toides*. *Elater crocatus*. *Windsor Forest*, Berks. *Lymexylon navale*. *Aspidiphorus orbiculatus*.—*Isle of Wight*. *Epipone melanocephala* and *lævipes*. *Elampus panzeri*.—*Dovor*, Kent. *Mancipium Daplidice*.—*Darenth Wood*, Kent. *Allantus cingulus*. *Melanoleuca funerella*. *Lissa dolium*.—*Birch Wood*. *Allantus ochropus*. *Ichneumon nycthemerus*. *Tengyra Sanvitali*.—*Coombe Wood*, Surrey. *Miscophus bicolor*. *Chrysis succincta*. *Cucujus Spartii*. *Drisphilus anobioides*.—*Monk's Wood*, Huntingdonshire. *Nothus bimaculatus*. *Thecla Pruni*.—*Colney-hatch Wood*. *Hamaticherus Heros*.—*Whittlesea-mere*, Huntingdonshire. *Sphercheus emarginatus*. *Lælia cænosa*.—*Southend*, Es-

sex. *Trachynotus foleator*. *Megachile Leachella*.—*Hampstead-heath*, Middlesex. *Sarrorium muticum*. *Methoca ichneumonides*. *Hedychrum roseum*.—*Battersea Fields*, Surrey. *Allantus dispar*. *Tropidia milesiformis*. *Helophilus lunulatus* and *frutetorum*.

MARSHES. The flowers of *buttercups*, and the rushes, flags, and flowers in ditches, harbour insects of almost all the orders, and often in profusion. The morasses of Lincoln, Bedford, and Cambridge, and Whittlesea Mere, in Huntingdonshire, produce many insects which are exceedingly rare in other places. *Spercheus emarginatus*, among many other very rare insects, has been taken at the latter place at the roots of aquatic plants.

MOUNTAINS, &c. The mountains, and indeed every part of Ireland, Scotland, and Wales, are nearly new ground to the foot of the collector; they produce novelties in abundance. To the enterprising, a visit to these places would be well rewarded. On Snowden Mr. Newman found the splendid *Chrysomela cerealis*.

FLOODS. The rejectamenta left by occasional floods in the Spring and Summer, should be collected as soon as the waters begin to subside, in large bags, and tied tight at the mouth,

and when brought home immersed in scalding water. The bags should be left to dry, and the rubbish examined at leisure, by shaking a little at a time over a sheet of white paper. By this plan, insects may be obtained in profusion.

ANIMALS, &c. Living animals, birds, fish, and even insects, should undergo a minute search when opportunity offers, for the parasitic insects which infest them. Birds in particular are subject to these pests, and almost every species has a parasite peculiar to itself. The examination of birds must be made while they are still warm, as the insects leave the body soon after it becomes cold. When the bird is almost cold, if it be placed on a warm white plate, or white paper covering a warm coloured plate, they will be easily discovered. They may be put into quills, and killed by dipping the quills in hot water. The insects may be then gummed on small wedges of stiff paper. The name of the bird or animal on which they are found should be attached to them.

MUSHROOMS AND TOADSTOOLS (*Fungi and Boleti*) are found on the ground in meadows, commons, and parks; and also on trees. They occasionally contain rare beetles. *Yponomeuta bifasciella* has been reared from one species.

A good plan, when a quantity is found, is, after examination, to put it into an open jar to attract insects, or lay it in a lump under a hedge; and when it begins to rot, many insects will be found in it. The *grubs* may be placed in a breeding jar by themselves, with plenty of food.

WINDOWS, &c. harbour many insects, and should always be examined; a collection of *gnats*, might be made from these situations alone. *Spiders' webs*, both in and out of doors, occasionally entangle rare insects.

GRANARIES, &c. The sweepings of granaries, corn bins, &c. particularly if corn has lain some time in them, will repay the trouble of examination. Some beetles and the *caterpillars* of several species of small moths will be found in the rubbish, particularly *Tinea grannella*. Tanyards, corn mills, and bakehouses, will also reward a search.

HOP GARDENS. The hop plant is infested with many peculiar *caterpillars* and *beetles*. But as it is too valuable to be beaten as before directed, many insects may be detected lurking under the leaves, while the plants are growing. But when the hops are being picked, those who live in the neighbourhood, have a fine opportunity of getting many insects.

SHEEP FOLDS, &c. should at all times be searched; and when the sheep are sheared, their parasites may be taken. Also about cattle, the *bot flies*, (*Æstrus*,) &c. may be taken. White horses are much tormented with the *forest fly*, (*Hippobosca equina*.)

BEEHIVES produce the *honey moth*, (*Galleria alvearia*), &c.

WASPS' NESTS, *Rhipiphorus paradoxus*.

HORNETS' NESTS, *Velleius dilatatus*.

ANTS' NESTS. *Claviger foveolatus*, has been found by Mr. Westwood in a nest of *Formica flava*, in Oxfordshire. *Dinarda dentata* and *Lomecusa emarginata*, are also found in ants' nests.

SNAILS. *Drilus flavescens* breeds in snails; the male is often taken in a lane leading from the village of Darent to the wood; the female, which is a fleshy insect, nearly an inch long, and apterous, is exceedingly rare. It might, however, be bred from the living snails. (*Helix aspersa*, &c.)

PECULIAR METHODS OF COLLECTING INSECTS.

THE following *peculiar methods* of entrapping insects, will be found very useful for obtaining many species, which are otherwise rarely taken. Several of these methods the author has found very successful.

LAYING BAITS AND TRAPS. An excellent method, and by which a great number of insects may be obtained, is by laying wide-mouthed bottles, baited with raw meat, tripe, &c. in sunny banks, concealed among the long grass. The bottles should be buried up to the neck, in an upright position, and as soon as the contents begin to decompose, many insects will be found, particularly *Silphidæ*, *Nitidulidæ*, and *Staphylinidæ*. They may be visited every morning, and the insects shaken out upon a sheet of paper, carried for the purpose. Traps similar in construction to those used in houses for catching *cockroaches*,

(*Blatta Orientalis*) and baited as recommended for the bottles, may also be employed. The aperture should be so small as not to admit mice, which are destructive to insects. Old cellars, subterraneous passages, barns, stables, damp pits, &c. also contain various insects, which may be taken by this method. Another plan, also very successful during the Spring and Summer, is laying bones (particularly *marrow bones*), with a little meat left on them, horns of sheep, &c. about sand and gravel pits, woods and gardens. An empty sugar cask, or a tub, or beehive smeared both inside and out with sugar and water, or honey and water, will attract the *Noctuidæ*, and some beetles. The tub or beehive should be elevated three or four feet from the ground, and placed near the border of a wood, or in a garden. Another trap will be found useful, which is simply laying any sweet matter (raspberry jam and water, honey water, &c.) thinly on a plate, and placing it beneath a hand glass raised a few inches from the ground by means of bricks, having previously removed three or four of the upper panes of glass. Upon this place another hand glass, with the glass entire, into which the moths will find their way, and may be easily captured.

ATTRACTING MOTHS, &c. The following method has been very successfully employed on fine moonless evenings, from March to November. Place a table near to an open window facing a garden, or in a summer-house, on which set a bright lanthorn or large lamp, the flame being secured by a glass, the light will attract *moths* and other nocturnal insects, and numbers may be taken with the bag-net or *forceps*. Barbut, Harris, and others, mention a practice which has long been successfully adopted by London collectors for attracting the males of the *fox*, and *grass egger moths*, (*Lasiocampa Rubi*, and *Quercus*.) When they have bred or taken a female of either of those species, they put her alive while a virgin, into a box with a gauze lid, and take her to a wood, and, in favourable weather, she never fails to attract a number of males, which are easily taken. There is little doubt but that the males of other species of insects might be taken in a similar manner.

Nothing by means of a lanthorn has before been recommended. Mr. Walton has been very successful in capturing various *Noctuæ*, &c. (some very rare), feeding on the ripe berries of the *Yew tree*, at various periods, from the latter end of September until the 14th of

November, at Norbury Park, near Dorking. He used a bull's-eye lanthorn and a bag net, and by throwing the light on a moth, and gently touching the twig on which it had alighted with the ring of the net, the moth would drop into it, and then by lowering the net with care to the ground, (for if alarmed or disturbed the insect would fly out of the bag,) he easily captured it with the forceps. The *Geometridæ* he found more active, and were only to be captured by striking at them with the net.*

The most barren places will sometimes prove productive. Mr. Raddon, while in search of the caterpillars of *Deilephila Euphorbiæ*, on the sandy wastes of Braunton Burrows, and Appledore Devon, could not find a single moth; but on accidentally stirring up some tufts of grass and herbage on the sandy hillocks, took several rare Noctuæ (*Mamestra Albicollis*, &c.) in great abundance. In dull weather they fell to the ground and were easily captured, but on windy or sunny days they flew with great swiftness.

DUNG OF HORSES, &c. The dung of various animals, if immersed in water, will leave the

* Ent. Mag.

insects swimming on the surface: many may be collected this way, which from their quick movements escape observation, in the ordinary mode of collecting. The same remark applies to dead animals. Pieces of board, laid on dung heaps or cucumber beds, in the months of June and July, will attract small beetles, (*Pse-laphidæ*), which will be found to adhere to the underside of the board. A white sheet laid on the ground on a hot summer's day, will also attract many insects, particularly if a plate containing a little jam and water be put on it.

OLD TREES, dead fences, and felled timber, should always be carefully examined. From the little round holes many *beetles* and *bees* may often be obtained, by inserting a stem of grass, or straw, and probing the holes to the bottom. Tobacco smoke blown into the holes, will also quickly bring them out. The *forceps* must always be kept close to the hole to catch the insect as soon as it appears. New oak pales attract many insects. Hedge-stakes, perforated with holes, should be carefully split, as they harbour small beetles and other insects. The holes bored in fruit trees in gardens should be smoked, or if they contain *larvæ* if a piece of gauze be tied round or fastened to the tree,

leaving a bag before the holes, the insects will be easily captured when they make their *exit*. *Platyrhinus latirostris* has been taken in June in some abundance at Bristol, by stripping off bark on decaying willows, and tacking it somewhat loosely on again, and examining it every day. Timber yards should be well searched, and the holes probed or smoked; but the insects found on or near foreign timber, should be kept separate and labelled.

BEATING TREES. Beating into a *clap net* or *umbrella* has already been recommended, but a far more profitable mode may be adopted, by two persons carrying a large sheet, while a third, with a pole twenty or thirty feet long, beats the higher branches of trees. Not only rare beetles and other insects are thus obtained, but also *caterpillars*, which only feed on the higher branches. From oaks the beautiful *caterpillar* of the *purple emperor butterfly* (*Apatura Iris*) may be beaten.

TAKING CATERPILLARS. A method of collecting caterpillars appeared in "The New Times," on the 24th of August, 1820; it might be tried in potatoe grounds in September, for taking the caterpillar of the *death's head moth*, (*Acherontia Atropos*) which, as well as many others, only feed by night, and conceal them-

selves during the day. “ A gardener at Glasgow has a mode of destroying *caterpillars*, which he discovered by accident. A piece of woollen rag had been blown by the wind into a currant bush, and when taken out was found covered with those leaf-destroying insects. He immediately placed pieces of woollen cloth in every bush in his garden, and found the next day that the *caterpillars* had universally taken to them for shelter. In this way he destroys many *thousands* every morning.” Many *caterpillars* may also be found at night by searching or beating the various plants in gardens, woods, and hedges, by means of a lantern.

INSECTS FOUND IN GUM ANIME, AMBER, &c. Many new, rare, and highly interesting insects, have been procured from Anime and Amber, and some also, it is said, have occurred in copal. These substances are soluble in Ether, or the essential oils of spike and lavender, and the insects may be extracted in a perfect state. Mr. Raddon has been very successful in procuring many new and rare insects from Gum Animé, and also from the skimmings procured from varnish makers. The insects in the skimmings he puts into a jar closed at the mouth, and filled with pure spirits of turpen-

tine, and sets the vessel on the hob of a grate for two days. If the insects be large he then opens the wings, and with a pair of scissors cuts open the body and puts it again into the turpentine. He then adds weak ammonia, and lets it simmer for two hours when they are completely cleared. Small, delicate, and high coloured insects, and also *Hymenoptera*, he in the first instance puts into alcohol instead of the spirits of turpentine. The insects are then set in the usual way. It need hardly be remarked that insects thus obtained must never be arranged with British Insects.



ON KILLING AND PRESERVING INSECTS.

WHETHER insects be possessed of feeling or not, (a point often mooted and the negative insisted on by some of the first naturalists,) every one ought, if only for the sake of his own feelings, to put them to the most speedy death possible. The following methods are recommended as effecting that end in general instantaneously.

BEETLES AND FIELD BUGS, (*Coleoptera* and *Hemiptera*) of a black or dark colour *only*, may be put into a phial half filled with weak spirits of wine, as collected ; when taken home pour the contents of the bottle on a piece of muslin over a cup, and return the spirit for future use ; then put the insects for a minute in hot water and then on blotting paper, to absorb the moisture. *Beetles, fieldbugs, and grasshoppers*, are instantly killed by being plunged into scalding water. When taken

out of the water they must be laid on blotting paper. The most preferable method of killing bright coloured *beetles*, &c. is to place them in a tin box, or canister, and then immerse it in boiling water, taking care that no water finds its way into the inside; the insects are thus instantly killed.

With regard to the larger kinds of *butterflies*, *moths*, and *dragon-flies*, when taken, they should be sharply pressed with the finger and thumb on the underside of the *thorax*, hard enough to kill, but not to injure their plumage; taking particular care not to touch the upper side of the wings. A pin should then be passed through the upper side of the thorax in an upright position, Pl. 1. fig. 3. Those which are more tenacious of life, are instantly killed by dipping a pin in aquafortis or oxalic acid, and piercing the insect in the breast. The large *moths* (*Sphinges*, &c.) and *dragon-flies*, may be instantly killed by taking them by the wings held over the back, and then dipping the under side only of the body in boiling water. Another plan is to place the insect under a tumbler, light a bit of german tinder half the size of a sixpence, to stupify them, and then pierce them with a proper pin, using another pin dipped in aquafortis or oxalic acid, to

pierce them in the breast. But a still better method is to fix a piece of cork to the bottom of a gallipot, stick the insect on the cork, and invert the gallipot in a bason of boiling water: the steam produces almost instant death, and does not injure its plumage.* Small *moths*, *flies*, &c. are instantly killed by the fumes of sulphur. If the insects are in pill boxes, elevate the lids on one side very slightly, place the boxes under a tumbler or bason, upon a piece of soft leather, and put a lighted match beneath, taking care not to scorch the boxes. When the match is suffocated withdraw it, and let the boxes remain for a few minutes, when the insects will be found dead. A small piece of german tinder applied in the same manner will answer the purpose, and is, perhaps, less objectionable.†

The flying insects (*Neuroptera*, *Hymenoptera*, *Trichoptera*, and *Diptera*,) may be killed by sulphur or german tinder as above, or piercing them in the breast with a pin dipped

* Newman.

† The eggs of butterflies and moths, which are often laid in the collecting box, should be carefully preserved, and the young caterpillars, when hatched, supplied with food. If their proper food be not known they should be tried with the leaves of various kinds of trees and plants.

in aquafortis or oxalic acid. Small insects in quills are immediately killed, by putting the quills into hot water. Minute *Hymenoptera* may be killed by dropping them in scalding water, and if a piece of stiff paper or card be placed under them, they may be taken up and set with their wings and legs extended, the moisture being sufficient to keep them in place.

Having *killed* the insects, the next step is to *preserve* them. *Beetles* should be pierced by pins adapted to their size, in a perfectly upright position, through the right *wing case* (*Elytron*)* at least a quarter of an inch, and never through the *thorax*. The *legs* and *antennæ* should be displayed in a natural position on the *setting board*, and kept so by means of bent pins, and braces, and the mouth of each specimen, if possible, should be expanded. The wings and wing cases of beetles, &c. may be extended by piercing the insect in the centre, between the two cases, and bracing them as shewn Pl. 1, fig. 4. Minute *beetles* and other insects, should be gummed† on small wedges of card or stiff paper, and the wedges stuck with

* The artist has by mistake placed the pin on the left side Pl. 1, f. 1.

† Common gum water will not hold sufficiently strong, a little isinglass should be mixed with it.

a pin (Pl. 1, fig. 6 and 7), or set out on small square pieces of card. The gum should be thinly spread, with a camel's hair pencil, and the insect placed upon it, the legs, &c. being extended by means of a clean camel's hair pencil. *Field bugs, butterflies, moths, bees*, and other winged insects, and also *flies (Diptera)* should be pierced through the thorax as represented in the plate, (1, fig. 2, 3, 4, 5.)

All the flying insects should have their wings extended before they become stiff, by means of *braces*, as shewn Plate 1, fig. 2, 3, 4, 5, the wings being elevated with the *setting needles*; and the *braces* must remain several days on the insects, until their moisture is evaporated, and they are quite stiff. Another method is to have a piece of cork, with grooves for the body and legs, and the wings are then set flat with broad braces. Mr. Shuckard's plan (by which he sets Hymenoptera most beautifully) is to raise a stage by means of two broad pieces of card, one to each pair of wings, and with two other broad pieces he confines the wings quite flat (Pl. 1. f. 2). As the underside of the wings of *butterflies* are not only very beautiful, but it being necessary to shew them to determine some of the species, those specimens whose upper wings are rubbed, should be selected for

the purpose, and pierced with a pin in the centre of the underside of the *thorax*. A single *brace* for each wing will often be sufficient, but in general several will be required as represented in Pl. 1. fig. 3. In piercing insects, it should always be remembered, that the pin should extend at least a quarter of an inch through the insect. To set insects well, requires considerable practice, and it would perhaps be too great a tax upon the patience of those who collect for their friends. It is, however, needless to trouble them, as the Entomologist can always relax the insects sent, and in most cases would prefer setting them himself. But they must be pierced as upright as possible. Small *moths* require very great care in piercing. After being killed as above directed, they should be shaken out of the box into the palm of the hand, and the pin passed through the thorax, (without touching the insect with the fingers,) the head of the pin inclining very much over the head of the insect; by this means, when the pin is placed upright on the setting board, the *moth* will be in such a position, that it will only be necessary to elevate the wings slightly with the *setting needle*, and the insect will be completely set, without the aid of *braces*.

The flying insects which have been pierced, are very easily relaxed, by sticking them on a piece of cork, and letting the cork float in a bason half filled with water, taking care that no part of the insect touches the cork. If the bason be covered with a damp cloth, they will relax quicker. Small delicate insects not pierced with a pin may be laid on damp blotting paper or flannel, and placed on the floating cork ; *beetles*, &c. may be speedily relaxed by putting them into hot water for a few minutes. Another mode is to place them in a vessel with spirits of wine at the bottom, and closing it very carefully to prevent evaporation. By this method they are easily relaxed, and may be kept in this atmosphere any length of time without getting mouldy.

If a leg or any part of an insect be broken it should immediately be gummed on, and on no account whatever should the *vile practice* of supplying limbs from another insect be adopted. Mouldy insects may be cleaned by brushing them with camel's hair pencils of different degrees of stiffness, dipped in hot water. Another plan is to take equal parts of *ether* and *eau de Cologne* and apply the mixture with a camel's hair pencil, but only to dark insects. When insects in the cabinet or boxes are found

to be infested with mites, &c. which will be known by the appearance of dust, if a beetle, immerse it in scalding water, but let it be thoroughly dry before replacing it; and if a winged insect, put it into a box and bake it on the hob for a few minutes. The colours of the *dragon flies* (*Libellulidæ*) and some *grasshoppers*, (*Locustidæ*, &c.) will be entirely lost, and the bodies shrivelled up unless they are stuffed; and the bodies of many large *moths* are also very liable to grease, unless stuffed. The underside of the body must be cut open by means of a fine pair of scissors, and the contents removed as carefully as possible, as soon as they are dead. The cavity should be nicely filled with a roll of white cotton or blotting paper, so as to give the insect its proper shape. The species of the *blossom eating beetles* (*Melœ*) with soft bodies must undergo the same process, but must not be distended beyond their "fair proportion." Old specimens of insects which turn greasy should be well saturated with pure spirits of turpentine, which will generally eradicate the grease. Should this not prove effectual, French chalk may be used, scraping it over them and then exposing them to heat, but the chalk must remain on for several days, and the process repeated if necessary. Mag-

nesia alone has been used with success. The oil of petroleum applied with a camel's hair pencil, and the insect placed in a warm situation to dry, has also been usefully employed.

To preserve the eggs of *butterflies* or *moths*, Swammerdam pierced them with a fine needle, and pressed the juice through the aperture; he then inflated them, until they regained their proper form, by means of a small glass tube, and then filled them with oil of *spike* in which some resin was dissolved. But if only punctured with a very fine needle they will dry without shrivelling. Hot water destroys the colour, and makes them contract.

TO PRESERVE CATERPILLARS. The animal must first be killed by immersion in spirits of wine, or hot water, and then put for a short time into some distilled vinegar mixed with spirits of wine to harden the parts; the contents of the body must then be extracted, or squeezed out by the gradual pressure of the thumb and finger, beginning at the head, and pressing on to the anus, at which part a small aperture should be previously made. When the inside is cleansed as much as possible by small rolls of blotting paper, introduce a stem of hay or slender straw into the anus, round which, and near to the extremity, pass loosely

a fine thread ; then blow through the tube, and when the skin is fully inflated, withdraw it, and at the same time pull the thread tight, and secure it by a knot. The *caterpillar* will now exhibit its proper shape and colours ; to retain which, all that is necessary, is to hold it near a fire or candle until perfectly dry, which will be in a few minutes. Another method is, when the contents of the body are removed as above, to fill the skin with very fine dry sand ; by this means the insect is brought to its natural shape ; in a few hours the skin will dry, and the sand may be shaken out. *Caterpillars* thus prepared, may be either pierced with pins or gummed on strips of card. They may also be preserved, without any further preparation, by merely suspending them from the cork in a phial filled with weak spirits of wine. The phial should be closely stopped, and the cork dipped in wax. Mr. Sells says that those “ that have been long immersed in spirits and thereby much hardened, admit of being opened, stuffed with cotton and dry very successfully.” When *caterpillars*, either from their rarity or otherwise, cannot be preserved, a coloured drawing should always be made of them when in their last skin.

The shells of *chrysalides* have merely to be

pierced through with a pin, or gummed on a piece of card when the insects have left them : or, if it be wished to kill a *chrysalis*, it may be done in a moment by dropping it into scalding water. Mr. Donovan says, that “ if the *chrysalides* which have the appearance of gold, are put into spirits of wine, they will always retain that colour, but, if the insect within is killed first, or, if the fly has quitted it, such appearance is entirely lost.”

TO PRESERVE SPIDERS. (*Aranea*, *Lin.*) This tribe of animals, which are exceedingly numerous, and present an infinite variety of form and beauty of marking, are generally neglected by the collector from the difficulty of preserving them. The following method is recommended by Mr. Donovan : “ After the *spider* is killed by means of hot water, the entrails should be immediately extracted, then inflate them by means of a blow pipe, and cleanse the inside no more than is sufficient to prevent mouldiness, for fear of injuring the colours ; the abdomen may then be filled with sand.” This will, in general, answer the purpose. Mr. Griesbach’s plan is to pierce the *spider* through the thorax with a pin, stick it in a deal box, and hold it near the fire for a few minutes, when the insect will be found

dead, the contents of the abdomen dried, and the form and colours preserved. It will require a little practice to determine the exact time it should remain; for if left too long, or the heat be too great, it will burst. They may also be preserved in spirits of wine or turpentine.

Insects must always be put away out of the reach of *mice*, *spiders*, *earwigs*, *ants*, &c. which will destroy in one night the labour of many days' collecting; camphor must be kept in the boxes to keep out mites, &c., which are very destructive to them. Too much care cannot be taken to have them thoroughly dry before placing them in the cabinet.

PACKING INSECTS. Great pains must be taken by the traveller in *packing*, or his labour will have been in vain. Those insects which are pierced, may be pinned firmly into a corked box; but loose ones are best sent in tin boxes, filled up with cotton, dry bran or sand, and filling up the box to prevent breakage. *Caterpillars* should have a plentiful supply of leaves, for food on their journey. Underground *chrysalides* should be sent in boxes covered with damp moss, while those which change above ground may be packed in dry moss, or cotton.

To remove the prejudice which is often felt

against insects by persons unacquainted with them, and yet are willing to collect for their friends, they may be assured, that, with the exception of *bees*, *hornets*, and *wasps*, (which may be secured by means of the *forceps*,) all the rest are perfectly harmless.

ON ARRANGING INSECTS IN CABINETS.

THE following mode of arrangement is adopted by London Entomologists, and is certainly the best calculated for displaying the affinities of a series of insects. Double pencil lines are ruled to form columns, according to the breadth of the insects, which are to be placed between them. The larger species of *Coleoptera*, *Orthoptera* and *Hemiptera* are arranged side by side in pairs, and the smaller species in a greater number in a row according to their size, having an open winged specimen below each species. *Hymenoptera*, *Trichoptera*, *Lepidoptera*, and *Diptera*, are arranged singly, placing the males first: the sexes are always procured if possible. Of the *butterflies* four specimens at least are retained; a male and female showing the upper side of the wings,

and one of each showing the underside. Of the *moths*, only the upper side is exhibited. Varieties are preserved as far as possible, as they are often of great use in determining species. One specimen at least, in its natural state, when at rest should be placed with each species. The generic name is struck by a pin at the head of a genus, and the specific name immediately after each species. The drawers must never be left without camphor.

HISTORICAL COLLECTION.

THE natural history of insects has a much higher claim on the attention of the young collector than merely collecting and arranging species. By forming an *historical* collection he will be induced to investigate their structure, habits and economy. For this purpose he should provide himself with a cabinet of 16 or 18 ordinary sized drawers, with two sufficiently deep for the larger sized nests, and two more of an intermediate depth. Boxes will not do so well, as many of the objects will not admit of being reversed. The following mode of arrangement (slightly altered) has been kindly communicated by William Sells, Esq.

1. *Transformations*. Eggs, larvæ, pupæ, shells of pupæ, cocoons and nests.—2. These combined, showing the complete history of an insect.—3. *Economy* of particular insects as bees, wasps, hornets, silk-worms, gall insects, spiders, &c.—4. *Monstrosities*. As herma-

phrodism, imperfect developement, &c.—5. *Analogies* between insects of different orders. 6. *Parasites* of different insects, with the insects on which they are found.—7. Insects *directly* injurious to man. Insects *indirectly* injurious ; as attacking animals, the horse, cow, sheep, &c. ; vegetables, turnips, hops, &c. ; wood borers, bark feeders, &c. ; with specimens of the injured materials.—8. Insects *useful* to man, as cochineal, gall flies, silkworms, bees, &c.—9. *Dissections*.—10. Miscellaneous.

Great care must always be taken to keep insects from damp ; and cabinets and boxes should, if possible, be arranged against the partition wall in a dry room.

ON COLLECTING AND PACKING EXOTIC INSECTS.

ALTHOUGH the foregoing instructions are more particularly adapted to collecting insects in England, yet they will, in a great degree, apply to the same operation abroad. The few exceptions may be pointed out. Insects being generally of a greater size, and much more abundant than in England, the collector must be prepared accordingly. His *nets* must be larger and longer, his *boxes* larger and more numerous, his *pins* longer and his stock greater, and the rest of his apparatus must be in proportion, adding knives, scissors, cards for braces, cotton for packing, &c. &c. He must be prepared, also, against the attacks of various enemies, such as white ants, cockroaches, &c. and lay in a stock of preservatives, such as camphor and spirits of turpentine. He will

also require some oxalic acid and aquafortis, for killing larger butterflies, moths, &c. His packing case should be either of tin, or wood cased with tin, and made to shut very close. Attorneys' deed boxes would answer the purpose. With regard to his collecting dress, whatever material his coat be made of, he will find the shooting jacket fashion the most convenient, and he should not fail to have as many pockets as possible, both inside and out; and he should furnish himself with "a pair of very loose canvas trowsers, the same as worn by sailors, with sliding strings at the bottom to draw close over boots or leather gaiters. Serpents may strike at such with impunity."

In collecting he should have bottles of various sizes, with and without spirits (rum, arrack, &c.), dark coloured *beetles*, *bugs*, *ear-wigs*, *cockroaches*, &c. to be put into the spirit bottle, and on his return from an excursion he should, with a pair of sharp-pointed scissors, open the underside of large beetles half an inch from the tail to allow the spirit to enter, and then put them into soda water, pickle, gooseberry, or other store bottles filled with spirits; when sent home they must be put into hot water for two or three minutes before they are pierced. The bright coloured *beetles*

and *bugs* to be collected in a dry bottle, having some bits of blotting paper and camphor therein: they must be killed with scalding water, then *thoroughly* dried and packed away in tin boxes, placing layers of cotton between them, sprinkled with turpentine and camphor. A large sugar or tea canister would be an excellent *depôt*. It must be made to close very tightly.

Butterflies, moths, and flying insects of all kinds, must be carefully caught and pinched on the breast sufficiently hard to kill or at least to *paralyse* them; they should then be pierced with a pin adapted to their size (but never with needles). Butterflies only should be pierced *laterally* through the thorax, and the horns placed between the wings. As soon as convenient the insects, if not dead, should be pierced in the breast with a pin dipped in aquafortis or oxalic acid. To save room and pins, two or more butterflies may be transfixed on one pin. Never attempt to set their wings out unless under very favourable circumstances, for this can be done at home, which will be a saving both of time and space. They must then be stuck in the store boxes (which should be placed in the packing case), and as they are filled it would

be well to put in a good supply of camphor fastened in muslin bags, and then paste or glue strips of linen over the openings. Sprinkling the boxes, &c. in the packing cases occasionally with spirits of turpentine will be found useful.*

Small flying insects may be caught in pill boxes and killed by the fumes of sulphur, or german tinder; minute beetles may be collected in quills, and killed by immersing the quills in hot water.

Grasshoppers, locusts, and caterpillars, may be preserved in spirits.

The collector should beat trees, placing a sheet beneath; he will by this mode get many rare and valuable insects. He should endeavour, as far as practicable, to rear butterflies and moths from the caterpillars.

He should at all possible times and places sweep the herbage with a bag-net, which will produce him myriads of insects, and though many of them will be small and apparently insignificant, yet he may be assured that they

* Every possible precaution must be taken to preserve the collection from the ants, and until finally packed the boxes, &c. should, if possible, stand on a table, having the feet placed in small vessels of water.

will prove as valuable to the Entomologist as the larger kinds. Small exotic insects are *very great* desiderata in collections, very few persons having attended to this mode of collecting. Should he adopt this method new discoveries will reward him at every step. *Aquatic insects* are also great desiderata.

When near the sea-shore the crustacea (crabs, lobsters, shrimps, &c.) should not be neglected. These may be collected and killed as after directed, and packed in jars containing spirits.

Scorpions, centipedes, and spiders may also be collected in spirits.

Whenever insects, &c. are found in pairs, they should, if possible, be preserved together.

Notes and observations on insects and their larvæ, and on any points of their history, economy, &c. will of course always be valuable, and where the name of the insect is not known, a corresponding number attached to the insect and inserted in the note book will be sufficient to identify the object. It would be desirable to note with every insect—1. The country where found—2. The season when taken—3. Habits—4. Habitat—5. Local name. The same of course applies to the *Crustacea*.

PACKING is a point of the utmost importance,

both as regards economy of space and the preservation of the collection. Insects and crustacea in spirits will of course remain uninjured, the bottles being well secured from breaking. The loose insects may be packed in tin canisters in layers of cotton, with alternate layers of calico, having camphor with spirits of turpentine sprinkled upon every layer. The butterflies, moths, &c. which may be pinned should be firmly fixed in the corked store boxes, and the whole kept quite dry. Large beetles and other hard-cased insects may be packed in fine dry sand, or bran sprinkled with powdered camphor. When the labours of the collector have terminated, he may secure his packing case in coarse canvas, and paint or tar it over, and write on it in large letters, **TO BE KEPT DRY.**

INSTRUCTIONS FOR COLLECT- ING AND PRESERVING CRUSTACEA.

As many Entomologists study Crustacea, a few brief instructions are added for collecting and preserving them.

Crustacea (familiar examples of which are *lobsters*, *crabs*, *shrimps*, and *woodlice*) are extremely numerous and highly interesting. They are found on the sea shore in empty shells, under stones, rubbish, sea weed, in little pools, or buried in the sand. Many species are also found in rivers, stagnant ponds, and ditches, and are often brought up in the net while *fishing* for insects. Some are found upon various kinds of fish; and others under the bark of decayed trees. After a storm, or gale of wind, as well as on the retiring of the tide, the beach should be well searched. It is

possible that some make their appearance only in the evening and night. The fishermen, oyster dredgers, and shrimp-catchers should be requested to preserve any which they may drag up; and the different fish brought to market should be examined. By this means rare and interesting species may be obtained. Some of these animals are extremely local, and the collector should be careful not to neglect the opportunity of taking a sufficient quantity, however plentiful they may appear.

The best plan for collecting small Crustacea is to put them into a wide mouthed bottle, half filled with equal parts of spirits and water. A gooseberry bottle will answer the purpose. The larger *crabs*, &c. should have their claws tied, to prevent their injuring each other, and may then be put into a bag. Those found near the sea, may be killed by being put into cold fresh water, and should remain some hours to extract the salt. The fresh water species are easily killed by being plunged into spirits of wine. Large specimens require to have the flesh removed; this may be done by separating the thorax from the body, and cutting out the flesh with a crooked instrument. The claws can only be cleared by breaking a hole on the underside. The parts should then

be stuffed with cotton dipped in corrosive sublimate. Where ants are plentiful, the specimens may be separated as above, and placed in or near an ant's nest. These little creatures will completely devour the flesh in a few hours. Shrimps and prawns must also have the flesh removed; they may then be stuffed with cotton and glued together again.

They should be pierced with proper sized pins, and their legs, &c. placed in a natural position. If intended to be sent to a distance, they may be stuck in a corked box, or wrapped in soft paper and packed in a box, on layers of cotton; taking particular care of their legs, &c. which are very brittle when dry.



INSTRUCTIONS FOR COLLECTING AND PRESERVING SHELLS.

SHELLS and the animals inhabiting them, are extensively collected by many persons who also collect insects. They are extremely numerous and highly interesting, inhabiting both salt and fresh water, and abound also on land, in trees, shrubs, and vegetables. They are very easily collected and transported, and constantly occur to the collector while in search of insects. A few instructions therefore on the best methods of collecting and preserving them may be useful.

Marine Shells are to be found on the sea shore, particularly after storms, and on the ebbing of the tide; also under sea weed, and rejectamenta. Fishermen and oyster dredgers drag up many species otherwise unattainable. Many occur among the Crustacea and esculent shell fish brought to market. Others, as the *Pholas* and *Teredo navalis*, perforate rocks, planks, posts, the shells of oysters, &c. Many

species are very local, and some situations produce them in abundance. The coasts of Devonshire and Cornwall are considered the most productive in England. Microscopic shells abound in sea sand.

Those shells which contain the live animals are greatly to be preferred, where there is a choice, to those which are empty, or in which the animal is dead ; as the specimens are much more bright, and an opportunity is afforded of studying the structure and habits of the animals. But in the case of rare species, of course, " all are fish that come to net." Live shells should, however, be kept in the sea water but a few days, and the animal may then be killed by immersion in scalding water, and, after the lapse of a few minutes, should be plunged in cold fresh water, which will condense the animal, and render it easier to be extracted. For the latter purpose crooked wires will in general be found useful, and if the animal be extracted whole, it may be preserved in bottles containing weak spirits of wine. All the *Testacea* may be preserved in spirits.

The fresh water shells will often be found in abundance while fishing for insects ; they inhabit stagnant ponds, ditches, &c. And

many of the land shells which inhabit trees and shrubs will occur while beating or searching for insects, and others will be found in damp places, and generally in the shade. The British species are very numerous.

The collector should be provided with a canvas bag for the larger species, and a wide-mouthed bottle or tin box for the smaller; also with one or two oyster knives for separating the *Patellæ*, &c. from the rocks. *Pholas*, &c. will require a hammer and chisel, to cut them out of stones and wood. A landing net with very small meshes, or the net used in fishing for insects, and a small spade to dig out those which bury in the sand, will also be necessary.

Bivalve Shells (*muscles*, *oysters*, *cockles*, &c.) are of little comparative value unless perfect. Both valves should be procured if possible, and care should be taken not to separate them. Some of the univalve shells have their whorls reversed, and are much sought after, and often bear a high price. The opercula or lids which close the mouths of some of the univalves should always be preserved.

Varieties both in size and colour should be procured as far as possible, and the traveller

should remember that Exotic fresh water and land shells are in *very great request*; and that no shells should be rejected on account of apparent similarity.

With respect to *cleaning* shells, all that is necessary is to put them for a short time into a solution of potash and soft soap, half a pound of each to half a gallon of water, and then to rinse them in clean water and wipe them dry. Rough shells will require a brush, but those with spines must be carefully handled to preserve them whole.

The operation of *polishing* shells is one of great nicety, and requires considerable practice. The conchologist seldom resorts to it, as the characters of the species are thereby in a great degree destroyed. But many of those with rough coats, as the *Ear Shells*, (*Haliotes*, &c.) are so very splendid, that, if specimens abound a few might be polished, their extreme beauty (otherwise not discovered) will amply repay the labour bestowed on them. With others, however, it is necessary to remove extraneous substances. The ingredient used for these purposes is nitric acid of different degrees of strength applied with a horse-hair pencil. When the acid used has evaporated, muriatic acid and sand must be rubbed on until the

surface is cleared. A file will often be useful, but it will require some skill to stop at the proper moment. When the rough coating is removed a rubber of leather glued on a piece of wood, dipped in fine powdered pumice diluted with a little oil, should be used, and the last polish given with fine red ochre. The shells should then be cleansed with warm water, then dipped in alkali to neutralize the effects of the acids used, and finally washed in clean water; and when wiped quite dry, may be covered with a weak solution of gum arabic.

As to *packing*, all that is necessary is, after the shells have been completely cleansed and dried, to place them in bottles, jars, or boxes mixed with fine dry sand or sawdust, or wrapped in cotton, so that they may not rub each other. Those with spines will require particular attention.

In *arranging* shells the best method with the smaller species is to have pieces of thin board, covered with white paper, of an uniform size and thickness, on each of which the specimens should be gummed. The univalves should be placed with their mouths downwards, except one specimen of each species, which should be reversed. A series of varieties graduating from the two extremes of size would

be desirable. The generic and specific names may be written beneath each species. The larger species may be arranged in drawers on layers of cotton, and their names gummed on them.

Purchasers of shells should be on their guard against the deceptions often practised in polishing them, staining them of different colours, and altering their markings; or, filing the mouth, &c. so as to completely alter the characters on which their specific distinctions depend.



THE END.

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